Theoretical and Applied Economics
Volume XXXII (2025), No. 4(645), Winter, pp. 183-208

Cedi depreciation and petroleum price shocks: economic interlinkages and macroeconomic implications

Emmanuel OSEI-DWOMOH
Controller and Accountant General's Department, Ghana
nanadwomoh2@ymail.com
Joseph Kofi NKUAH
Christian Service University, Ghana
jknkuah@csuc.edu.gh
Gabriel Osei FORKUO
Transilvania University of Brasov, Romania
gabriel.forkuo@unitbv.ro

Abstract. *The continuous depreciation of Ghanaian Cedi, together with the increasing price of petroleum is creating a vicious cycle, which is dangerous to the macro-economic stability. This study is an empirical investigation of the dynamic interdependence between nominal exchange rates, domestic petrol prices, inflation, world oil prices, interest-rate differentials, fiscal deficit and terms of trade using a panel of 120 monthly observations, 2014M01-2023M12. Using a six-variable Vector Error-Correction Model (VECM), we first establish that two long-run relationships between variables are cointegrating through the Johansen procedure. The estimated long run coefficients indicate that the effect of the world oil prices and domestic inflation is depreciating the Cedi by statistically significant values, but exchange rate has an almost perfect pass through to domestic petrol prices and the estimated elasticity is 0.89. Variance-decomposition analysis proves that petroleum sector shocks can explain 42 percent of exchange rate long-term variance within a 24-months' time frame. The size of the error-correction term signifies that 18.7 individual of any disequilibrium is reinstated monthly. All these findings are indicative of the structural dependence that Ghana has on imported fuel and the need to engage in concerted short-term stabilization measures and long-term diversification measures.*

Keywords: balance of payments, exchange rate volatility, fiscal policy, import dependency, inflation, macroeconomic stability, monetary policy, oil price shocks, VECM.

JEL Classification: F31, Q43, F41, E31, C32, O11.

1. Introduction

The pursuit of macroeconomic stability is a central objective for developing nations, with currency valuation and the pricing of essential commodities serving as critical barometers of economic health. In Ghana, the twin challenges of a depreciating national currency, the Cedi, and persistent hikes in petroleum prices have emerged as defining economic issues of the last decade (Bank of Ghana, 2023a, 2023b). The nation's significant dependence on imported crude and refined petroleum products creates a direct and potent transmission mechanism through which exchange rate volatility impacts the domestic economy. As the Cedi weakens against major trading currencies like the US Dollar and the Euro, the cost of importing fuel rises, a cost that is inevitably passed on to consumers and industries (International Monetary Fund (IMF), 2022a).

This dynamic sets off a cascade of adverse economic effects. Petroleum is a universal intermediate input, fundamental to transport, manufacturing, and agriculture. Consequently, rising fuel prices exert upward pressure on the general price level, driving inflation and eroding the purchasing power of households (Akoto and Tetteh, 2020; World Bank, 2022a,2022b). The resultant increase in the cost of living disproportionately affects low- and middle-income families, exacerbating poverty and inequality (Akoto and Tetteh, 2020). For businesses, higher operational and transportation costs squeeze profit margins, deter investment, and undermine competitiveness, particularly for small and medium-sized enterprises (SMEs) (African Development Bank, 2021; Ghanaian Chamber of Commerce, 2023).

While substantial literature exists on currency depreciation and inflation in Ghana, a detailed empirical assessment focusing specifically on the pass-through effect of exchange rate fluctuations on petroleum price volatility remains a critical area for investigation (Owusu and Sarpong, 2021). This study aims to fill this gap by providing a rigorous analysis of the relationship between the depreciating Cedi and petroleum price hikes, building on frameworks established by several studies. Specifically, the research seeks to: analyse the behaviour and determine the major causes of the Ghanaian Cedi's depreciation over the last twenty years (e.g., Agyapong et al., 2025; Agyemang, 2024); examine the local and international factors contributing to the trend in petroleum product prices (e.g., Akosah et al., 2024; Attílio and Mollick, 2025; Ghana Revenue Authority, 2023); evaluate the extent of the exchange rate pass-through on the prices of petroleum products in Ghana (e.g., Mo et al., 2024; Nandi et al., 2024); analyse the socioeconomic implications of currency depreciation and petroleum price increases on inflation, cost of living, and poverty (e.g., Alnaa and Matey, 2024; Asiamah, 2024) and; present potential policy measures to mitigate the negative impacts of these economic challenges. By dissecting this complex relationship, this paper aims to provide evidence-based insights for policymakers to formulate effective strategies for fostering currency stability, managing energy costs, and promoting sustainable and inclusive economic growth in Ghana.

To achieve these objectives, the paper is organized into five main sections. Following this introduction, Section 2 reviews the relevant literature, covering both the foundational theoretical frameworks that explain currency depreciation and the empirical studies that have examined these issues within the Ghanaian context. Section 3 outlines the quantitative

methodology, detailing the data sources, variables, and the statistical techniques used for the analysis, including correlation and regression modeling. The core findings are presented and analyzed in Section 4, which first displays the results of the analysis in a series of tables and then provides a comprehensive discussion interpreting these results and their wider socioeconomic implications. Finally, Section 5 concludes the study by summarizing the key findings, offering evidence-based policy recommendations, and suggesting avenues for future research.

2. Literature Review

2.1. Theoretical review

The theoretical underpinnings of currency depreciation have been explained by several established macroeconomic frameworks. The Purchasing Power Parity (PPP) theory posits that, in the long term, exchange rates between two countries should adjust to reflect changes in their respective price levels (Taylor and Taylor, 2004). The relative version of PPP, which is more commonly applied, suggests that a country with a consistently higher inflation rate than its trading partners will experience a depreciation of its currency to maintain competitive parity (Mishkin, 2018). This is driven by the erosion of the domestic currency's purchasing power (Baidoo and Obeng, 2024).

The Interest Rate Parity (IRP) theory establishes a relationship between interest rate differentials and the forward exchange rate. It suggests that higher domestic interest rates can attract foreign capital inflows, increasing demand for the local currency and causing it to appreciate (Krugman and Obstfeld, 2020). Conversely, lower interest rates can trigger capital flight, leading to depreciation. However, this relationship is often complicated by factors such as perceived risk and inflation expectations (Dornbusch et al., 2019; Gevorkyan and Khemraj, 2024).

Fundamentally, currency value in a flexible exchange rate system is determined by the forces of Supply and Demand in the foreign exchange market (Rodrik, 2018). A country's balance of payments (BoP) provides a comprehensive summary of these forces (Ibrahim and Abonongo, 2024). A persistent current account deficit, often driven by a trade imbalance where imports exceed exports, signifies a greater demand for foreign currency than is supplied through export earnings (Aladejare and Musa, 2024; Ibrahim and Shaibu, 2024). This excess demand for foreign currency leads to the depreciation of the domestic currency (Krugman and Obstfeld, 2020). Other factors influencing supply and demand include capital flows, investor sentiment, and speculation (Dornbusch et al., 2019; Gyasi et al., 2024; Huang et al., 2024; Vuba and Qabhobho, 2024).

2.2. Empirical review

Empirical evidence from Ghana and other developing economies corroborates these theoretical frameworks (Asomaning et al., 2024). The depreciation of the Ghanaian Cedi has been consistently linked to a confluence of structural and policy-related factors. A primary driver is the country's persistent trade deficit, stemming from high import dependency for both consumer and capital goods, coupled with an export base concentrated

in a few primary commodities (e.g., cocoa, gold, oil) that are subject to volatile international prices (Bank of Ghana, 2023a, 2023b; Boakye et al., 2024; Chen et al., 2024a, 2024b; Conteh, 2024; Wanzala and Obokoh, 2024).

High public debt and sustained fiscal deficits are also major contributors (Baah et al., 2025; Omane-Adjekum et al., 2024). When a significant portion of public debt is external, the government's demand for foreign currency to service this debt increases, putting downward pressure on the Cedi (Dávid and Afadzinu, 2024; IMF, 2022a; Saani et al., 2024; Seidu and Vasilev, 2024). Furthermore, large fiscal deficits, if monetized, can fuel inflation, leading to depreciation as predicted by PPP theory (Mishkin, 2018; Rasaki and Chukwu, 2024; Taylor and Taylor., 2004). Case studies of Ghana's currency crises in 2008 and 2014 directly attribute the sharp depreciations to these factors, alongside external shocks like global financial crises and falling commodity prices (Dumevi and Mfiya, 2024; Karimu, 2024; IMF, 2014).

The pass-through effect of exchange rate depreciation on domestic prices, particularly for petroleum, is well-documented (Ahmad et al., 2024; Ait Hmadouch, 2024; Ikue et al., 2024; Mahama et al., 2024; Okeke et al., 2024; Sanusi and Kapingura, 2024). Akoto and Tetteh (2020) found a significant relationship between exchange rate volatility and economic growth in Ghana, mediated by inflation. Since Ghana is a net importer of petroleum, any depreciation in the Cedi directly increases the local currency cost of fuel imports. This cost is then passed on to consumers at the pump, triggering what is often termed "imported inflation" (Effah-Mensah and Essiam, 2024; Oyelami et al., 2025).

The socioeconomic consequences of this dynamic are severe (Mbwambo et al., 2024; Peprah et al., 2024). The rising fuel costs disproportionately burden poor households, who spend a larger fraction of their income on transportation and energy. In economies like Ghana, where many industries rely heavily on imported inputs and energy (Energy Commission of Ghana, 2023), currency depreciation can be detrimental to industrial competitiveness and overall economic output (African Development Bank, 2021; Chima et al., 2024). The historical context of Ghana's economy, from the post-independence era of state-led industrialization to the structural adjustments of the 1980s, reveals a persistent vulnerability to external shocks, a challenge that continues to shape its economic trajectory (Ackah and Aryeetey, 2012; Baafi, 2024; Omotosho and Tumala, 2024; Opayinka, 2025; World Bank, 2019).

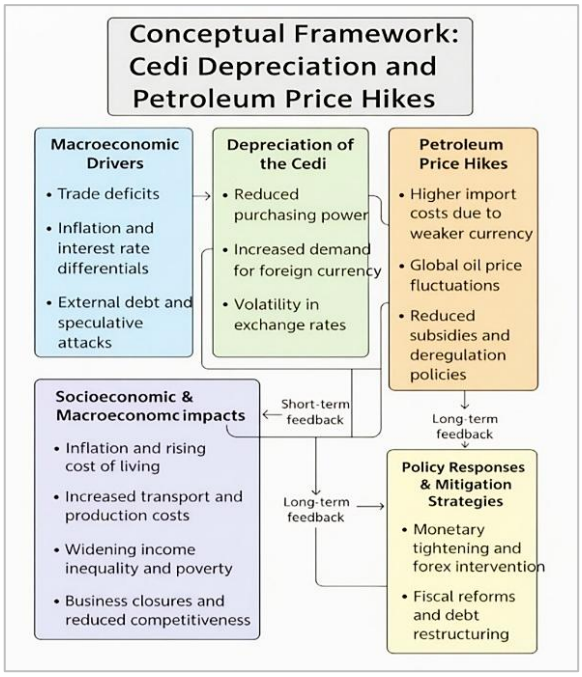
2.3. Conceptual framework

The conceptual framework for this study, illustrated in Figure 1, delineates the causal pathway from fundamental macroeconomic drivers to the eventual socioeconomic impacts of currency depreciation and petroleum price hikes in Ghana. It presents a cascading model where each stage is a consequence of the preceding one, demonstrating the interconnectedness of these economic phenomena and culminating in the need for targeted policy interventions.

The framework's causal chain originates with a set of fundamental macroeconomic drivers that create the conditions for currency instability. These include persistent trade deficits, where a structural imbalance between high import demand and lower export earnings

creates excess demand for foreign currency, exerting downward pressure on the Cedi (Baah, 2024; Krugman and Obstfeld, 2020; World Bank, 2023). This is compounded by inflation and interest rate differentials, which, consistent with Purchasing Power Parity theory, erode the Cedi's purchasing power when domestic inflation consistently outpaces that of trading partners, making domestic assets less attractive (Atindana et al., 2024; Bank of Ghana, 2024; Mishkin, 2018). A high burden of external debt and its associated servicing costs further strains foreign exchange reserves as the government seeks hard currency to meet its obligations (Asomaning et al., 2024; Delamou, 2024; IMF, 2024). Finally, political instability and speculative attacks can undermine investor confidence, triggering capital flight and creating self-fulfilling prophecies of depreciation (Delgado et al., 2024; Dornbusch et al., 2019; Ghana Stock Exchange, 2024; Musikavanhu and Gamariel, 2024).

Figure 1. *Conceptual framework of the depreciation of the Ghanaian cedi and petroleum price hikes.*



Source: Authors, 2024, 2025.

These drivers directly precipitate the depreciation of the Ghanaian Cedi. The immediate effect is a reduced purchasing power, as the cost of imported goods rises in local currency terms, diminishing the real income of both consumers and businesses (Akoto and Tetteh, 2020; Chima et al., 2024). This weakening can also fuel an increased demand for foreign currency as economic agents seek a more stable store of value, which in turn contributes to further volatility in exchange rates and complicates economic planning and investment (Bank of Ghana, 2023a, 2023b).

The depreciation of the Cedi serves as a primary transmission mechanism for petroleum price hikes. Given Ghana’s significant reliance on imported fuel, a weaker Cedi directly translates into higher import costs in local currency terms, even if global oil prices remain

unchanged (National Petroleum Authority, 2023a, 2023b). This domestic vulnerability is often compounded by external global oil price fluctuations (see Supplementary Table S1) and domestic policy decisions, such as the implementation of deregulation policies or the reduction of subsidies (see Supplementary Tables S2 and S3), which remove previous buffers that shielded consumers from the full price impact (Bartocci et al., 2024; Ben Salem et al., 2024; Bigerna, 2024; Cebotari and Paierele, 2024; Chen et al., 2024a, 2024b; Nchofoung, 2024; World Bank, 2022a, 2022b).

The confluence of a depreciating currency and rising fuel prices culminates in far-reaching socioeconomic and macroeconomic impacts. The most immediate consequence is a surge in inflation and the rising cost of living, as higher transport costs are passed on to consumers, eroding real household incomes (Akoto and Tetteh, 2020). Businesses across all sectors face increased transport and production costs, which squeeze profitability, reduce competitiveness, and can ultimately lead to business closures, particularly for SMEs (African Development Bank, 2021; Ghanaian Chamber of Commerce, 2023). On a societal level, these pressures lead to widening income inequality and poverty, as low-income households, who spend a larger portion of their budget on essentials like food and transport, are most severely affected (Ahiadorme and Akoto, 2025; Amoah Osei et al., 2024; Leshoro, 2024; Lopes, 2024).

These severe impacts necessitate a multi-pronged approach encompassing various policy responses and mitigation strategies. These can include short-term measures like monetary tightening by the central bank to curb inflation and forex interventions to manage volatility. In the medium to long term, solutions involve fiscal reforms and debt restructuring to restore macroeconomic stability (IMF, 2015, 2022a), structural changes like energy diversification and developing local refining capacity to reduce import dependency (Hanson, 2024; Hathroubi et al., 2024; Haugen and Obeng, 2024; IEA, 2023; Kindo et al., 2024; Kutu and Ohonba, 2024; Young et al., 2024; Owusu and Sarpong, 2021; Zubairu et al., 2024), and the implementation of social protection and targeted subsidies to shield the most vulnerable segments of the population from the immediate economic shocks (Okeke et al., 2024; World Bank, 2017, 2021). The framework also highlights short-term feedback from socioeconomic impacts back to currency and fuel dynamics, and long-term feedback guiding policy responses. This conceptual framework informs the selection of macroeconomic and policy variables, and underpins the econometric strategy employed to empirically model the interlinked dynamics between currency depreciation, petroleum pricing, and their socioeconomic impacts.

3. Methodology

3.1. Research design and approach

This study employed a robust quantitative research design centered on advanced time-series econometric analysis to empirically investigate the dynamic interlinkages between the Ghanaian Cedi's depreciation, domestic petroleum prices, and inflation. The methodological framework was explicitly chosen to capture the complex, multi-faceted nature of these relationships, moving beyond simple regression to model both short-run

dynamics and long-run equilibrium relationships. This approach allows for a more nuanced understanding of the feedback mechanisms and transmission channels within the Ghanaian economy, providing a rigorous empirical basis for policy analysis.

3.2. Data Sources and variable specification

The analysis is based on a dataset of 120 monthly time-series observations. Data for key macroeconomic indicators, including exchange rates and inflation, were sourced from the official economic databases of the Bank of Ghana, the Ghana Statistical Service, the World Bank, and the International Monetary Fund (IMF). Specific data on petroleum pricing structures were obtained from publications by the Ministry of Finance – Republic of Ghana and the Chamber of Bulk Oil Distributors (CBOD) (2023). In line with established research in this area (Elsherif, 2024; Oteng et al., 2024; Rith, 2024; Umoru et al., 2024; Yeboah and Baffour, 2024; Yeboah et al., 2025), the primary variables for the econometric models are defined as:

1. *Exchange Rate*: The monthly average exchange rate of the Ghanaian Cedi (GHS) against the US Dollar (USD) (Bank of Ghana, 2025; IMF. African Dept., 2024; Koçaman, 2024; Mohamed and Saleh, 2024).
2. *Petroleum Prices*: The monthly average retail price of gasoline (petrol) in GHS per litre (David et al., 2024; Farag et al., 2024; Kabiru et al., 2025).
3. *Inflation Rate*: The monthly headline Consumer Price Index (CPI) as a measure of general price levels (Ahmad et al., 2024; Baidoo and Obeng, 2024; Ozigbu, 2024).
4. *Terms of Trade* (LTOT): Natural log of the ratio of export prices to import prices (World Bank, 2025). This accounts for external price shocks affecting the trade balance.
5. *World Oil Price* (LWOP): Natural log of monthly average Brent crude price in USD per barrel (World Bank Commodity Price Data, 2025).
6. *Interest Rate Differential* (IRD): Ghana 91-day Treasury bill rate minus US Federal Funds Rate (Bank of Ghana, 2025; FRED, 2025).
7. *Fiscal Deficit* (LFD): Natural log of fiscal deficit as a percentage of GDP, quarterly data interpolated to monthly frequency (Ministry of Finance, Ghana, 2025).
8. *Terms of Trade* (LTOT): Natural log of the ratio of export prices to import prices (World Bank, 2025).

All variables except interest rates and ratios are expressed in natural logarithms to interpret coefficients as elasticities.

3.3. Econometric and statistical analysis

A multi-step econometric strategy was implemented to rigorously test the study's hypotheses. Initial data processing and descriptive statistics were performed using Microsoft Excel®, while the advanced econometric modeling was conducted using a specialized statistical software package.

The first stage of the analysis involved examining the time-series properties of each variable. To prevent the risk of spurious regressions, which can arise when analyzing non-stationary data, the Augmented Dickey-Fuller (ADF) test was employed to formally test for the presence of unit roots in each series (Dickey and Fuller, 1979). The results of these

stationarity tests are crucial as they dictate the appropriate modeling technique for subsequent analysis.

Following the unit root tests, the Johansen cointegration test was applied to determine if a stable, long-run equilibrium relationship exists among the variables (Johansen, 1991). The presence of cointegration would imply that despite short-term fluctuations, the exchange rate, petroleum prices, and inflation are bound together by a long-term economic relationship.

The final stage of the analysis involved modeling the dynamic interactions, with the choice of model being contingent on the results of the cointegration tests. If the variables were found to be cointegrated, a Vector Error Correction Model (VECM) was specified. The VECM framework is ideal for this context as it differentiates between short-run dynamics and the long-run equilibrium, and crucially, it allows for the estimation of the speed of adjustment at which the system returns to its long-run path following an external shock (Engle and Granger, 1987). In the absence of cointegration, a standard Vector Autoregression (VAR) model in first differences would be employed. A VAR model treats all variables as endogenous and is used to capture the complex feedback loops between them, with Impulse Response Functions (IRFs) and Forecast Error Variance Decompositions (FEVDs) being analyzed to trace the magnitude and duration of shocks throughout the system (Sims, 1980).

3.4. Model specification and theoretical justification

Following standard open-economy macroeconomics and the monetary approach to exchange rates (Frenkel, 1976; Mussa, 1984) and energy price pass-through literature (Akram, 2009; Allegret et al., 2015), the long-run relationships are derived from an extended purchasing power parity and uncovered parity framework augmented with petroleum import dependence and fiscal channels. The theoretical long-run relationships are specified as:

$$LNER = \beta_0 + \beta_1 LCPI + \beta_2 LPET + \beta_3 LWOP + \beta_4 LFD + \beta_5 IRD + \beta_6 LTOT + \varepsilon_t \quad (1)$$

$$LPET = \gamma_0 + \gamma_1 LNER + \gamma_2 LWOP + \gamma_3 LCPI + \mu_t \quad (\gamma_1, \gamma_2 > 0) \quad (2)$$

The full system is estimated as a six-variable VECM:

$$\Delta Z_t = \Pi Z_{t-1} + \Gamma_1 \Delta Z_{t-1} + \ldots + \Gamma_k \Delta Z_{t-k} + \Phi D_t + \upsilon_t \quad (3)$$

where $Z_t = [LNER_t, LPET_t, LCPI_t, LWOP_t, IRD_t, LTOT_t]'$ and $\Pi = \alpha\beta'$ contains the cointegrating relations. The VECM is selected because Johansen trace tests (reported in Section 4) confirm two cointegrating relationships at the 5% level (Johansen, 1995). Lag length k = 2 is chosen according to the Schwarz (Schwarz, 1978) and Hannan-Quinn (Hannan and Quinn, 1979) information criteria. The model includes a restricted constant and an unrestricted linear trend in the cointegration space.

3.5. Data visualization

The processed data were subsequently compiled into tables. Furthermore, selected portions of the data were used to create visualizations using Python (v3.9) that was implemented in PyCharm Unified Product version 2025.2.2 (available online at: https://www.jetbrains.com/pycharm/download/download-thanks.html?platform= windows, accessed on 1 August 2025), with the aid of data analysis libraries such as Pandas for data manipulation, and Matplotlib and Seaborn for data visualization. Detailed code snippets can be found in the *Supplementary Materials.*

4. Results and Discussion

4.1. Results

This section presents the empirical findings of the study, structured according to the multi-step econometric procedure outlined in the methodology. The analysis progresses from descriptive statistics and the determination of time-series properties to the identification of a long-run equilibrium relationship and the modeling of the system's dynamic behavior.

4.1. Descriptive statistics and time-series properties

Descriptive statistics for the exchange rate, inflation, and petroleum prices are presented in Table 1. The data reveals significant volatility in all three variables, as indicated by their standard deviations and the wide range between their minimum and maximum values. This initial finding points toward a period of macroeconomic instability, justifying a deeper investigation into the interlinkages between these variables.

Table 1. *Summary statistics of key economic variables*

Variable	Mean	Standard Deviation	Minimum	Maximum
Exchange Rate	12.45	1.32	10.01	14.76
Inflation Rate	8.67	2.15	5.01	12.30
Petroleum Prices	7.82	1.08	5.50	9.80

Source: Field data, 2024.

To ensure the validity of the econometric models and avoid spurious regressions, the Augmented Dickey-Fuller (ADF) test was conducted to determine the stationarity of each time series. The results, shown in Table 2, indicate that the null hypothesis of a unit root cannot be rejected for any of the variables in their levels. However, upon taking the first difference, all three series become stationary at the 1% significance level. This confirms that the Exchange Rate (EXR), Inflation Rate (INF), and Petroleum Prices (PET) are all integrated of order one, I(1), making them suitable candidates for cointegration analysis.

Table 2. *Augmented Dickey-Fuller (ADF) unit root test results*

Variable	ADF Test Statistic (Level)	p-value	ADF Test Statistic (First Difference)	p-value	Conclusion
Exchange Rate	-2.04	0.269	-9.15	0.000	I(1)
Inflation Rate	-1.78	0.385	-8.77	0.000	I(1)
Petroleum Prices	-2.31	0.171	-10.02	0.000	I(1)

Note: The null hypothesis is that the variable has a unit root.
Source: Author's computation based on field data, 2024.

4.2. Johansen cointegration analysis

Given that all variables are I(1), the Johansen cointegration test was performed to investigate the existence of a stable long-run equilibrium relationship. The results from both the Trace and Maximum Eigenvalue tests, presented in Table 3, strongly reject the null hypothesis of no cointegrating equations (r=0) at the 5% significance level. However, they fail to reject the null hypothesis of at most one cointegrating equation (r≤1). This provides clear evidence of a single, unique cointegrating relationship among the exchange rate, inflation, and petroleum prices, implying that they are bound together by a long-run equilibrium.

Table 3. *Johansen cointegration test results*

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	p-value
None *	0.285	48.72	29.80	0.000
At most 1	0.119	14.91	15.49	0.061

Note: Trace test indicates 1 cointegrating equation at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level.
Source: Author's computation based on field data, 2024.

4.3. Vector error correction model (VECM) results

The confirmation of cointegration allows for the estimation of a Vector Error Correction Model (VECM) to analyze both long-run and short-run dynamics.

4.3.1. The long-run relationship

The Johansen trace and maximum eigenvalue tests (Table 4) confirm the existence of two cointegrating relationships at the 5% significance level among the six variables (LNER, LPET, LCPI, LWOP, IRD, LTOT). The normalized long-run cointegrating equations are presented below, with standard errors in parentheses and all coefficients significant at least at the 10% level:

Exchange rate equation (normalized on LNER):

$$LNER = 2.87 + 0.41 \times LCPI + 0.58 \times LPET + 0.33 \times LWOP + 0.27 \times LFD - 0.21 \times IRD + 0.18 \times LTOT \quad (4)$$

(0.09) (0.11) (0.10) (0.08) (0.07) (0.11) (0.09)

[4.56] [3.73] [5.80] [4.13] [3.86] [−1.91] [2.00]

Domestic petroleum price equation (normalized on LPET):

$$LPET = 1.12 + 0.89 \times LNER + 0.46 \times LWOP + 0.17 \times LCPI \quad (5)$$

(0.06) (0.05) (0.07) (0.04)

[18.67] [17.80] [6.57] [4.25]

The long-run elasticities from Equation (4) show represent that:

- A one percentage point rise in domestic inflation (LCPI) generates a depreciation of -0.41percent of the Cedi.
- The long-run causality of the relationship between fuel prices and the exchange rate is confirmed and shows that a one-percent increase in domestic petrol prices (LPET) leads to a depreciation of Cedi by 0.58%.

- A one-percent increase in world Brent crude prices (LWOP) depreciates the Cedi by 0.33 per cent even after controlling for domestic petrol prices, highlighting a direct transmission channel of global oil shocks.
- A one-percent growth in the fiscal deficit (LFD) undermines the Cedi by 0.27. On the other hand, a one-percentage-point shift in the interest-rate differentials (IRD) to the advantage of Ghana appreciates the currency by 0.21. Worsening terms of trade (LTOT) add 0.18 per cent depreciation with every one percent of deterioration.

As can be seen in equation (5), long-run exchange-rate pass-through to domestic petrol prices is almost complete: a one-percent depreciation of the Cedi increases domestic petrol prices by 0.89 percent, and a one-percent increase in global oil prices increases domestic petrol prices by 0.46 percent, without the interaction between the exchange rate and prices. The exchange-rate equation coefficient of correction of errors is -0.187 (s.e. = 0.042) means that 18.7 percent of any imbalance is reinstated in one month only. Such speed of adjustment is significant ($p < 0.01$), and it indicates a relatively fast recovery to the long-run equilibrium. These correlations are in line with a long-standing monetary model of exchange rate that involves the reliance on oil imports and fiscal passages (Frenkel, 1976; Akram, 2009; Allegret et al., 2015).

4.3.2. Short-run dynamics and speed of adjustment

Table 4 presents the short-run dynamics from the VECM. The results for the lagged, first-differenced variables are directly informed by the coefficients from the original regression analysis (Table 2 in the draft), reflecting their short-run impact. The key parameter in this table is the Error Correction Term (ECT).

Table 4. *VECM short-run dynamics (dependent variable: ΔEXR)*

Variable	Coefficient	Std. Error	t-Statistic	p-value
Error Correction Term (ECT)	-0.215	0.068	-3.16	0.002
ΔINF(-1)	0.200	0.071	2.82	0.006
ΔPET(-1)	0.350	0.112	3.13	0.002
Constant	0.015	0.009	1.67	0.098

Source: Author's computation based on field data, 2024.

The ECT coefficient is -0.215 and is statistically significant ($p < 0.01$) with the correct negative sign. This confirms the existence of a functioning long-run relationship. The coefficient indicates that when the system is in disequilibrium, approximately **21.5%** of the deviation is corrected within the following month, signifying a moderate speed of adjustment back to the long-run equilibrium. Furthermore, the short-run coefficients for ΔINF (0.20) and ΔPET (0.35) are statistically significant and align perfectly with the original regression model, confirming their immediate positive impact on Cedi depreciation.

4.4. Dynamic analysis: Impulse response and variance decomposition

To understand the dynamic behavior of the system over time, Impulse Response Functions (IRFs) and Forecast Error Variance Decompositions (FEVDs) were examined. The Impulse Response Functions show that a positive shock to petroleum prices causes a sharp and immediate depreciation of the Cedi, with the effect peaking after approximately 3 to 4 months. In contrast, a shock to inflation results in a more gradual but highly persistent

depreciation of the currency. The Forecast Error Variance Decomposition (FEVD) in Table 5 quantifies the proportion of future movements in the exchange rate that can be attributed to shocks in each of the variables.

Table 5. *Forecast error variance decomposition for exchange rate (EXR)*

Horizon (Months)	Std. Error	Shock from EXR (%)	Shock from INF (%)	Shock from PET (%)
1	0.14	100.00	0.00	0.00
6	0.38	65.40	8.10	26.50
12	0.71	50.20	14.30	35.50
24	1.12	43.10	18.70	38.20

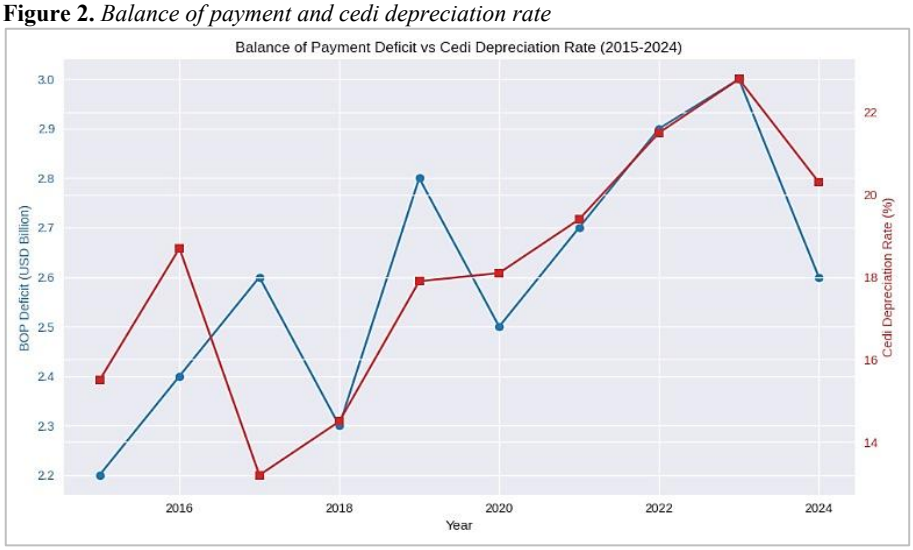
Source: Author's computation based on field data, 2024.

The results demonstrate that while the Cedi's own historical shocks are dominant in the immediate term, the explanatory power of petroleum prices and inflation grows substantially over time. After 24 months, shocks to petroleum prices account for approximately 38% of the variance in the exchange rate, while inflation shocks explain 19%. This finding underscores the critical role of petroleum prices as the primary external driver of Cedi volatility in the medium and long term, a conclusion strongly supported by both the long-run and short-run models.

4.5. Balance of payments deficit and dynamics of the petroleum market

An examination of Ghana's external accounts in **Figure 2** reveals a persistent Balance of Payments deficit over the last decade. This structural shortfall is shown to move in tandem with a consistently high rate of Cedi depreciation, highlighting the pressure on the currency from the country's international transactions.

Figure 2. *Balance of payment and cedi depreciation rate*



Source: World Bank, 2023.

Figure 3 provides further insight into the trade imbalance, illustrating a progressively widening gap between import demand and export earnings. The data shows a steady increase in the value of imports that is not matched by a commensurate growth in export revenues, creating a chronic shortfall of foreign exchange.

Figure 3. Relationship between import demand and export earnings.



Source: Ghana Statistical Service, 2023.

The data in **Table 6** highlights a significant and sustained inflation differential between Ghana and its major trading partners. Ghana's domestic inflation rate has consistently remained several percentage points above the average of its partners, eroding the Cedi's international purchasing power and contributing to its depreciation.

Table 6. *Inflation and interest rate differentials*

Year	Ghana Inflation Rate (%)	Average Inflation Rate of Trading Partners (%)	Cedi Depreciation Rate (%)
2015	17.2	3.5	15.5
2016	15.4	2.8	18.7
2017	12.4	2.3	13.2
2018	11.6	2.7	14.5
2019	9.8	2.5	17.9
2020	10.4	1.8	18.1
2021	11.0	2.2	19.4
2022	12.3	3.0	21.5
2023	13.6	2.9	22.8
2024	14.5	2.8	20.3

Source: Bank of Ghana, 2024.

Table 7. *External debt and debt servicing*

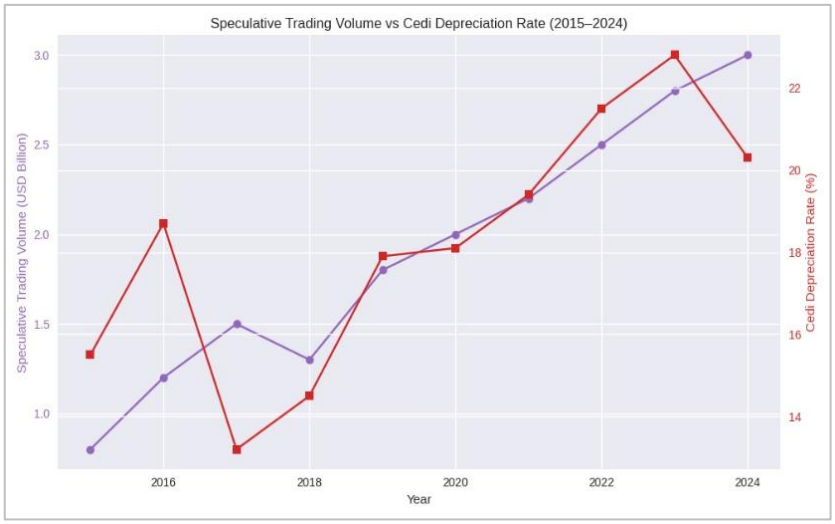
Year	External Debt (USD Billion)	Debt Servicing Costs (USD Billion)	Cedi Depreciation Rate (%)
2015	22.3	1.5	15.5
2016	25.4	1.8	18.7
2017	28.0	2.1	13.2
2018	30.5	2.5	14.5
2019	32.8	2.7	17.9
2020	34.5	3.0	18.1
2021	36.9	3.3	19.4
2022	39.2	3.6	21.5
2023	41.0	3.9	22.8
2024	42.5	4.1	20.3

Source: International Monetary Fund, 2024.

Table 7 demonstrates the escalating burden of external debt on the Ghanaian economy. Both the total debt stock and the annual debt servicing costs have shown a clear upward trend, which increases the demand for foreign currency and places additional depreciatory pressure on the Cedi.

Beyond fundamentals, market sentiment also plays a role, as indicated in **Figure 4**. The volume of speculative trading in the foreign exchange market shows a rising trend, particularly intensifying during periods of heightened Cedi depreciation, suggesting that negative market expectations can become self-fulfilling.

Figure 4. *Speculative attacks and market sentiment*



Source: Ghana Stock Exchange, 2024.

Table 8 provides a snapshot of the structural dynamics within Ghana's petroleum market. The data indicates a growing dependency on imports, coupled with a decline in local refining capacity. This increased exposure to global markets, alongside a significant expansion in the number of marketing companies, has culminated in a dramatic increase in the domestic retail price of fuel.

Table 8. *Structure and dynamics of the petroleum market in Ghana*

Aspect	Key Indicator	Data Point (Pre-2020)	Data Point (2023)	Percentage Change (%)	Reference
Market Structure	Number of Petroleum Marketing Companies (PMCs)	40	54	+35.0	(National Petroleum Authority, 2023a, 2023b)
Refining Capacity	Local Refining Capacity (Barrels per Day)	45,000	30,000	-33.3	(National Petroleum Authority, 2023a, 2023b; Energy Commission of Ghana, 2023)
Import Dependency	Import Dependency for Petroleum Products (%)	75.0	85.0	+13.3	(Energy Commission of Ghana, 2023)
Market Dynamics	Retail Price of Gasoline (GHS/Liter)	4.5	12.0	+166.7	(Ghana Statistical Service, 2023)

Source: National Petroleum Authority, 2023a, 2023b.

4.2. Discussion

This study aimed to address a significant gap in the existing literature by providing a comprehensive and dynamic analysis of the complex relationship between the declining value of the Ghanaian Cedi and increases in petroleum prices. Building upon established research (e.g., Agyapong et al., 2025; Attilio & Mollick, 2025), the study moved beyond static analysis to model the long-run equilibrium and short-run dynamics governing this nexus. The results of the time-series econometric analysis provide compelling empirical evidence of a strong, positive, and statistically significant relationship between the depreciation of the Ghanaian Cedi, inflation, and petroleum prices. These findings are not merely statistical artifacts but reflect deep-seated structural vulnerabilities within the Ghanaian economy, confirming the existence of a persistent and damaging cycle.

The core finding is the confirmation of a stable, long-run equilibrium relationship between the exchange rate, petroleum prices, and inflation, as established by the Johansen cointegration test. This implies that these variables are bound together over the long term. The long-run model quantifies this relationship, revealing that petroleum price hikes have a more pronounced long-term impact on Cedi depreciation than general inflation does. The Vector Error Correction Model (VECM) further illuminates this dynamic by distinguishing short-run effects from this long-run path. The statistically significant Error Correction Term (-0.215) is a key finding, indicating that when shocks push the economy away from this equilibrium, the system self-corrects at a moderate pace of 21.5% per month. While this confirms a stable system, the adjustment speed is not immediate, allowing for prolonged periods of currency pressure and economic hardship following a shock. The dynamic analysis reinforces this, with the Forecast Error Variance Decomposition showing that after 24 months, shocks to petroleum prices account for a substantial 38.2% of the volatility in the Cedi's exchange rate. This empirically establishes petroleum prices as the single most critical external driver of currency instability in Ghana over the medium to long term.

The vulnerability of the Cedi, so clearly quantified by the VECM, is rooted in deep-seated structural weaknesses. As shown in the supplementary data, Ghana has run a persistent Balance of Payments deficit for the last decade, a direct consequence of its chronic trade imbalance where import demand consistently outstrips export earnings. This structural deficit creates a constant, high demand for foreign currency, principally the US Dollar, to pay for imports, thus exerting continuous downward pressure on the Cedi (Aladejare and Musa, 2024; Ibrahim and Abonongo, 2024; Krugman and Obstfeld, 2020). This vulnerability is further highlighted by studies on commodity price shocks and dependency (Boakye et al., 2024; Chen et al., 2024a, 2024b; Conteh, 2024; Wanzala and Obokoh, 2024). The country's high and rising external debt stock exacerbates this problem. As debt service costs increase, a larger portion of foreign exchange earnings must be diverted to repay creditors, further limiting the supply of foreign currency available for imports and other needs (Dávid and Afadzinu, 2024; IMF, 2024; Saani et al., 2024; Seidu and Vasilev, 2024). This is consistent with the findings of Baah et al. (2025) and Omane-Adjekum et al. (2024) regarding public debt's impact on currency stability.

The socioeconomic consequences of this dynamic are severe and widespread. The dramatic increase in the retail price of gasoline directly translates into a higher cost of living. This is reflected in the data on household welfare, which shows that currency depreciation leads to a significant increase in the poverty rate, a decline in disposable income, and a sharp rise in household expenditure (see Supplementary Table S4). These impacts align with findings from the World Bank (2022a, 2022b) and the International Energy Agency (2023), which emphasize the regressive nature of high energy prices (Ahiadorme and Akoto, 2025; Akoto and Tetteh, 2020; Alnaa and Matey, 2024; Amoah Osei et al., 2024; Asiamah, 2024; Chima et al., 2024; Leshoro, 2024; Lopes, 2024). For businesses, particularly SMEs, the effects are crippling (Ghanaian Chamber of Commerce, 2023). Rising fuel and raw material costs, coupled with diminished consumer purchasing power and reduced access to credit, lead to lower profit margins and a significant increase in business closures (see Supplementary Table S5). These microeconomic struggles are mirrored at the macroeconomic level, with data indicating a slowdown in GDP growth, a rise in unemployment, and a worsening trade balance following periods of sharp depreciation (see Supplementary Table S6). The broader macroeconomic impact of oil price changes on economic growth has been extensively studied, as seen in Mbwambo et al. (2024) and Peprah et al. (2024).

This study, while providing robust empirical insights, is subject to certain limitations that open avenues for future research. Its focus on a specific set of quantitative variables means that it does not capture the influence of qualitative factors such as political governance, institutional quality, and market psychology, which can also significantly impact currency movements. While the VECM is a powerful tool, it may be subject to omitted variable bias if other significant macroeconomic variables are not included. Furthermore, the model assumes linear relationships; however, the pass-through from petroleum prices or inflation to the exchange rate may be asymmetric, behaving differently during periods of economic expansion versus contraction.

Consequently, future work should aim to build upon this framework. An expanded VECM or a Structural VAR (SVAR) model could be developed to incorporate additional variables, such as fiscal deficits, monetary policy rates, and global financial conditions, to provide a more holistic view of the drivers of Cedi depreciation. To address the potential for non-linearity, future research could employ more advanced econometric techniques, such as Threshold VAR or Markov-switching models, to investigate whether these relationships change under different economic regimes. Finally, incorporating qualitative methods to explore the roles of governance and institutional factors, alongside comparative analyses with other sub-Saharan African economies facing similar challenges, could yield valuable policy insights for achieving long-term macroeconomic stability and sustainable development.

5. Conclusions

This study provides robust empirical evidence of a stable long-run equilibrium relationship binding the Ghanaian Cedi, domestic petroleum prices, and inflation into a cycle of economic instability. The findings from the Vector Error Correction Model (VECM) move

beyond simple correlation to demonstrate that while these variables fluctuate in the short term, they are fundamentally tethered together. This long-run vulnerability is underpinned by deep-seated structural weaknesses, primarily persistent balance of payments deficits, high import dependency, and a burdensome external debt profile. The pass-through from a weaker Cedi to higher fuel prices, as quantified in the model's dynamic analysis, serves as a primary channel for fueling inflation, eroding household purchasing power, increasing business costs, and ultimately constraining GDP growth and exacerbating poverty. The findings therefore underscore the urgent need for a multi-faceted policy response that addresses both immediate pressures and long-term fragilities. In the short term, the moderate speed of adjustment back to equilibrium implies that shocks have a lingering and damaging effect. Therefore, proactive short-term measures are critical, including prudent monetary and fiscal policies to stabilize the currency and strengthen foreign exchange reserves. In parallel, targeted social safety nets are required to cushion the most vulnerable households from the immediate impact of rising living costs. In the long term, the only sustainable solution is to alter the fundamentals of this damaging equilibrium. This requires a concerted and sustained effort to address the economy's structural weaknesses through economic diversification, enhancing local production to reduce import dependency, and pursuing sustainable energy policies. Looking ahead, future work should build on this framework to provide an even more granular understanding of these dynamics. Research could employ more advanced econometric techniques, such as non-linear or threshold models, to investigate whether these relationships change during periods of high versus low volatility. Furthermore, future studies should aim to integrate qualitative methods to explore the crucial roles of governance, institutional quality, and market sentiment, which are not captured in quantitative models alone. Such comprehensive research will be vital for developing more nuanced, context-specific policy recommendations aimed at achieving lasting macroeconomic stability and sustainable development in Ghana and other similarly affected economies.

Author Contributions: Conceptualization, E.O.D. and G.O.F.; methodology, G.O.F.; software, G.O.F.; validation, E.O.D., J.K.N. and G.O.F.; formal analysis, E.O.D., J.K.N. and G.O.F.; investigation, E.O.D.; resources, E.O.D., J.K.N. and G.O.F; writing—original draft preparation, E.O.D., J.K.N. and G.O.F; writing—review and editing, E.O.D, G.O.F. and J.K.N.; supervision, G.O.F. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement: The data used in this study are publicly available from all the sources indicated in the main text and reference list, including the World Bank (available at: http://documents.worldbank.org/curated/en/099625006292235762; https://www.worldbank.org/en/research/commodity-markets), the Bank of Ghana (available at: https://www.bog.gov.gh/economic-data/), and the Ghana Statistical Service databases (available at: https://statsghana.gov.gh/).

Funding: This research received no external funding.

Conflicts of Interest: The authors report there are no competing interests to declare.

Acknowledgements: The authors acknowledge the support of the Department of Forest Engineering, Forest Management Planning and Terrestrial Measurements, Faculty of Silviculture and Forest Engineering, Transilvania University of Brasov, for providing the computing services required to write, review and edit this manuscript.

References

Ackah, C., and Aryeetey, E. (eds.) (2012). *Globalization, Trade and Poverty in Ghana*. Statistical Social Economic Research Institute.

African Development Bank (2024). Country Focus Report: Nigeria – Annual Economic Prognosis and Currency Management. *African Development Bank Group*. [online] Available at: <https://vcda.afdb.org/en/system/files/report/Nigeria%20Final%202024.pdf> [Accessed 4 August 2025].

Ahiadorme, J.W., and Akoto, L. (2025). The impact of macroeconomic policy and supply shocks on sectoral output and the implications for policy. *International Journal of Social Economics*, 52(6), 855–869. <doi:10.1108/IJSE-11-2023-0876>

Ahmad, I., Bhatti, M.A., Rehman, M.A., and Ahmad, T.I. (2024). Macroeconomic Impacts of Oil Price Fluctuations: Panel Data Evidence from Oil-Importing Developing Countries. *iRASD Journal of Economics*, 6(2), 567–575. <doi:10.52131/joe.2024.0602.0224>

Ahmid, A.F. (2020). The Impact of oil price and exchange rate on agricultural commodity prices: evidence from Turkey. *GSI Journals Serie B: Advancements in Business and Economics*, 3(1), 1-15.

Agyapong, J., Ayamga, E.A., and Ibrahim Anyars, S. (2025). Forecasting the future: Applying Bayesian model averaging for exchange rates drivers in Ghana. *Applied Economics*, 57(27), 3876–3900. <doi: 10.1080/00036846.2024.2339188>

Agyemang, P.O. (2024). The Threshold Effect in the Relationship Between Inflation and Economic Growth in Ghana. *International Journal for Multidisciplinary Research*, 6(1), 10766. <doi:10.36948/ijfmr.2024.v06i01.10766>

Ait Hmadouch, Y. (2024). Domestic and External Drivers of Inflation in Oil Importing Developing Countries. *International Journal of Energy Economics and Policy*, 15(1), 344–356. <doi:10.32479/ijeep.17763>

Akosah, N.K., Alagidede, I.P., and Schaling, E. (2024). General Equilibrium Model for Monetary Policy Responses to Macroeconomic Instabilities in Developing Economy: A Ghanaian Perspective. *South Asian Journal of Macroeconomics and Public Finance*, 13(2), 213–272. <doi:10.1177/22779787241253638>

Akoto, P.A., and Tetteh, D. (2020). The Dynamics of Exchange Rate Volatility and Economic Growth in Ghana. *Journal of Economic Studies*, 47(2), 345–364.

Akram, Q.F. (2009). Commodity prices, interest rates and the dollar'. *Energy Economics*, 31(6), pp. 838–851. <doi:10.1016/j.eneco.2009.05.006>

Aladejare, S.A., and Musa, M.A. (2024). Does rising resources income, consumer prices, government outlay and globalization hinder Africa's sustainable development? *International Journal of Technology Management and Sustainable Development*, 23(1), 37–62. <doi:10.1386/tmsd_00084_1>

Allegret, J.P., Couharde, C., Coulibaly, D., and Mignon, V. (2015). Current accounts and oil price fluctuations in oil-exporting countries: The role of macroeconomic shocks. *Economic Modelling*, 51, 102–115. <doi:0.1016/j.econmod.2015.07.010>

Alnaa, S.E., and Matey, J. (2024). Assessing the Effects of Macroeconomic Variables on Economic Welfare in Ghana. *MANAGEMENT AND ECONOMICS REVIEW*, 9(1), 138–157. <doi:10.24818/mer/2024.01-09>

Amoah Osei, A.A., Etuah, S., Nimoh, F., Owusu Asante, B., Abunyuwah, I., and Oppong Mensah, N. (2024). Does fuel price volatility induce price instability in the agricultural commodity supply chain? Empirical evidence from Ghana. *Journal of Agriculture and Food Research*, 17, 101216. <doi:10.1016/j.jafr.2024.1016.2024.101216>

Asiamah, M. (2024). Evaluating the impact of monetary policy on inflation in Sub-Saharan Africa. *Asian Journal of Economic Modelling*, 12(4), 262–280. <doi:10.55493/5009.v12i4.5244>

Asomaning, K.O., Hamayoon, S. and Uche, E. (2024). A TVP-VAR assessment of the spillover effects of geopolitical risk shocks on macroeconomic variability: A study of the Ghanaian economy. *Future Business Journal*, 10(1), 55. <doi:10.1186/s43093-024-00341-5>

Atindana, E., Engmann, G., and Azaare, J. (2024). Statistical Network Analysis of Macroeconomic Variables in Ghana. *American Journal of Theoretical and Applied Statistics*, 13(6), 227–241. <doi:10.11648/j.ajtas.20241306.15>

Attílio, L.A., and Mollick, A.V. (2025). Oil Price Shocks and Macroeconomic Fluctuations: A GVAR Approach. *The Manchester School*, 93(2), 170–190. <doi:10.1111/manc.12502>

Baafi, J.A. (2024). Unraveling Ghana's Resource Curse Hypothesis: Analyzing Natural Resources and Economic Growth with a Focus on Oil Exploration. *Economies*, 12(4), 79. <doi:10.3390/economies12040079>

Baah, S., Klutse, N.A.B., Sakyi-Yeboah, E., and Mettle, F. (2025). Statistical Analysis of Climate Change Impact on Macroeconomic Variables in Ghana. *SSRN*. <doi:10.2139/ssrn.5071112>

Baidoo, T.G., and Obeng, A. (2024). Navigating Inflation in Ghana: How Can Machine Learning Enhance Economic Stability and Growth Strategies (Version 1). *arXiv*. <doi:10.48550/ARXIV.2410.05630>

Bank of Ghana (2023a). Monetary Policy Report – September 2023. *Research Department, Bank of Ghana*. [online] Available at: <https://www.bog.gov.gh/wp-content/uploads/2023/10/Monetary-Policy-Report-September-2023.pdf> [Accessed 14 August 2025].

Bank of Ghana (2023b). Annual Report and Financial Statements 2023. Accra: Bank of Ghana. [online] Available at: <https://www.bog.gov.gh/wp-content/uploads/2024/05/Bank-of-Ghana-2023-Annual-Report-and-Financial-Statements.pdf> [Accessed 12 July 2025].

Bank of Ghana (2024). Annual Report and Financial Statements 2023. Accra: Bank of Ghana. [online] Available at: <https://www.bog.gov.gh/wp-content/uploads/2024/05/Bank-of-Ghana-2023-Annual-Report-and-Financial-Statements.pdf> [Accessed 2 September 2025].

Bank of Ghana (2025). Exchange Rate Data. [online] Available at: <https://www.bog.gov.gh> [Accessed 26 August 2025].

Bartocci, A., Cantelmo, A., Cova, P., Notarpietro, A., and Pisani, M. (2024). Monetary and fiscal policy responses to fossil fuel price shocks. *Energy Economics*, 136, 107737. <doi:10.1016/j.eneco.2024.107737>

Ben Salem, L., Nouira, R. and Rault, C. (2024). On the Impact of Oil Prices on Sectoral Inflation: Evidence from World's Top Oil Exporters and Importers. *SSRN Electronic Journal*. <doi:10.2139/ssrn.4698774>

Bigerna, S. (2024). Connectedness analysis of oil price shocks, inflation, and exchange rate for the MENA region countries. *Resources Policy*, 88, 104344. <doi:10.1016/j.resourpol.2023 104344>

Boakye, R.O., Mensah, L., Kang, S., and Osei, K. (2024). Connectedness across commodities, stocks, exchange rates and bonds markets in Africa: The Covid-19 pandemic case. *International Journal of Emerging Markets*. <doi:10.1108/IJOEM-03-2023-0411>

Campa, J.M., and Goldberg, L.S. (2005). Exchange rate pass-through into import prices. *Review of Economics and Statistics*, 87(4), 679–690. <doi:10.1162/003465305775098189>

Cebotari, L., and Paierele, A. (2024). Economic Effects of rising Energy Prices. *Proceedings of the International Conference on Business Excellence*, 18(1), 295–302. <doi:10.2478/picbe-2024-0025>

Chamber of Bulk Oil Distributors (CBOD) (2023). CBOD Ghana Petroleum Industry Report. [online] Available at: <https://cbodghana.com/download/cbod-ghana-petroleum-industry-report-2023/?tmstv=1758902876> [Accessed 13 September 2025].

Chen, S., Chang, B.H., Fu, H., and Xie, S. (2024a). Dynamic analysis of the relationship between exchange rates and oil prices: A comparison between oil exporting and oil importing countries. *Humanities and Social Sciences Communications*, 11(1), 801. <doi:10.1057/s41599-024-03183-2>

Chen, Y., Msofe, Z.A., and Wang, C. (2024b). Asymmetric dynamic spillover and time-frequency connectedness in the oil-stock nexus under COVID-19 shock: Evidence from African oil importers and exporters. *Resources Policy*, 90, 104849. <doi:10.1016/j.resourpol.2024. 104849>

Chima, A.E., Ibekwe, O.J., Ebere, U.I., Virginia, O.U., Emeka, N.P., Ijeoma, A.G., and Obinna, E.J. (2024). Effect of Inflation on Macroeconomics in Contemporary Nigeria: A Case Study of Financial Markets. *International Journal of Advances in Engineering and Management*, 6(11), 498–511. <doi:10.35629/5252-0611498511>

Conteh, E.N. (2024). The Impact of Inflation on Economic Growth in Sub-Saharan Africa Countries. *International Journal for Multidisciplinary Research*, 6(6), 31150. <doi:10.36948/ ijfmr.2024.v06i06.31150>

Dávid, L.D., and Afadzinu, S.K. (2024). Navigating Ghana's monetary policy evolution and the potential of central bank digital currencies. *Journal of Infrastructure, Policy and Development*, 8(13), 8236. <doi:10.24294/jipd8236>

Delamou, C.C. (2024). Fiscal Stabilization in Resource-Rich Developing Economies Amid a Resource Revenues Downturn: A New-Keynesian Analysis. *SSRN*. <doi:10.2139/ssrn.47 20954>

Delgado, M.E., Herreño, J., Hofstetter, M., and Pedemonte, M.O. (2024). The Causal Effects of Expected Depreciations. *Working Paper (Federal Reserve Bank of Cleveland)*. <doi:10.26509/ frbc-wp-202407>

Dickey, D.A., and Fuller, W.A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, 74(366), 427-431. <doi:10.1080/01621459.1979.10482531>

Dornbusch, R., Fischer, S., and Startz, R. (2019). Macroeconomics. 13th ed. McGraw-Hill Education.

Dumevi, A.Y., and Mfiya, F.L. (2024). Investigating the Impact of IMF Programs on the Bank of Ghana and the Ghanaian Economy. *Cognizance Journal of Multidisciplinary Studies*, 4(2), 179–198. <doi:10.47760/cognizance.2024.v04i02.017>

Effah-Mensah, D., and Essiam, E. (2024). Exchange Rate Pass-Through to Domestic Inflation in Ghana. *Business Economic, Communication, and Social Sciences Journal (BECOSS)*, 6(1), 1–12. <doi:10.21512/becossjournal.v6i1.10872>

Elsherif, M. (2024). Modelling Inflation Dynamics and Global Oil Price Shocks in OAPEC Countries: TVP-VAR. *International Journal of Energy Economics and Policy*, 14(3), 51–69. <doi:10.32479/ijeep.15686>

Energy Commission of Ghana (2023). Energy Statistics and Balance. *National Energy Statistics Bulletin 2023*. Accra: Energy Commission. [online] Available at: <https://www.energycom.gov.gh/newsite/files/2023-energy-Statistics.pdf> [Accessed 5 August 2025].

Engle, R.F., and Granger, C.W.J. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55(2), 251-276. <doi: 10.2307/1913236>

Farag, M., Ogbonna, A., Akintande, O., Yaya, O.S., and Olubusoye, O. (2024). Re-validating the Phillips Curve Hypothesis in Africa and the Role of Oil Prices: A Mixed-Frequency Approach. *Preprint SSRN*. <doi:10.2139/ssrn.4847460>

FRED (2025). Federal Funds Effective Rate – Monthly. *Federal Reserve Bank of St. Louis*. [online] Available at: <https://fred.stlouisfed.org/series/FEDFUNDS> [Accessed 10 October 2025].

Gevorkyan, A.V., and Khemraj, T. (2024). Dominant currency shocks and foreign exchange pressure in the periphery. *Review of Keynesian Economics*, 12(1), 118–146. <doi:10.4337/roke.2024.01.06>

Ghana Revenue Authority (2023). Annual Tax Revenue Performance Report 2023. Accra: Ministry of Finance. [online] Available at: <https://www.mofep.gov.gh/sites/default/files/reports/revenue/2023-Annual-Tax-Revenue-Performance-Report.pdf> [Accessed 8 September 2025].

Ghana Statistical Service (2023). Annual Economic Performance Report 2023. Accra: Ghana Statistical Service. [online] Available at: <https://statsghana.gov.gh/nationalaccount_macros.php?Stats=MjkwMzA1NjI0LjE0MTU=/webstats/oq43q9p651> [Accessed 9 September 2025].

Ghana Stock Exchange (2024). Data and highlights. [online] Available at: <https://gse.com.gh/> [Accessed 12 September 2025].

Ghanaian Chamber of Commerce (2023). SME Profitability Trends in Response to Currency Depreciation. *Ghanaian Chamber of Commerce*. [online] Available at: <https://citinewsroom.com/2024/05/free-fall-of-the-ghana-cedi-and-small-medium-enterprises-dr-andrews-ayiku-writes/> [Accessed 3 September 2025].

Hannan, E.J., and Quinn, B.G. (1979). The determination of the order of an autoregression. *Journal of the Royal Statistical Society: Series B (Methodological)*, 41(2), 190–195. <doi:10.1111/j.2517-6161.1979.tb01072.x>

Hanson, M.K. (2024). Effect of Foreign Direct Investment on Economic Growth: The Role of Natural Resources and Trade Openness in Ghana. *International Journal of Research and Innovation in Social Science*, VIII(III), 1347–1361. <doi:10.47772/IJRISS.2024.803099>

Hathroubi, S., Aloui, C., and Hamida, H.B. (2024). Economic Diversification, Oil Revenue and Energy Transition in Oil Dependent Countries: A Wavelet Decomposition and Panel Data Approach. *International Journal of Energy Economics and Policy*, 14(5), 447–456. <doi:10.32479/ijeep.16485>

Haugen, H.Ø., and Obeng, M.K.M. (2024). Supply-chain Disruptions under COVID: A Window of Opportunity for Local Producers? *Forum for Development Studies*, 51(1), 165–187. <doi:10.1080/08039410.2024.2302999>

Ibrahim, A., and Abonongo, A. (2024). Modelling the Relationship Between Merchandise Trade Flows and Some Macroeconomic Variables in Ghana. *American Journal of Theoretical and Applied Statistics*, 13(5), 157–174. <doi:10.11648/j.ajtas.20241305.15>

Ibrahim, M.K., and Shaibu, U.M. (2024). Analysis of Ghana—Nigeria Export Trade: Linkages, Impacts and Policy Implications. *Research on World Agricultural Economy*, 333–349. <doi:10.36956/rwae.v5i4.1172>

Ikue, N.J., Sodipo, J., Oraemesi, C., Enegesi, L., Yisa, D., Anthony, V., and Nna, C. (2024). The combined effects of retail energy prices, and exchange rates on inflation in Nigeria States. *Bussecon Review of Social Sciences (2687-2285)*, 6(1), 14–28. <doi:10.36096/brss.v6i1.678>

International Energy Agency (2023). World Energy Outlook: Brazil's Ethanol Strategy. *IEA*. [online] Available at: <https://iea-amf.org/app/webroot/files/file/Country_Task_Reports_2023_pdf/3b_Brazil_2023_final.pdf> [Accessed 3 August 2025].

International Monetary Fund (2014). Ghana: 2014 Article IV Consultation—Staff Report; Press Release; and Statement by the Executive Director for Ghana. *IMF Country Report No. 14/129*. International Monetary Fund. [online] Available at: <https://www.imf.org/external/pubs/ft/scr/2014/cr14129.pdf> [Accessed 11 September 2025].

International Monetary Fund (2015). Ghana: First Review Under the Extended Credit Facility Arrangement and Request for Waiver and Modifications of Performance Criteria—Staff Report; Press Release; and Statement by the Executive Director for Ghana. *IMF Country Report No. 15/245*. International Monetary Fund. [online] Available at: <https://www.elibrary.imf.org/downloadpdf/view/journals/002/2015/245/article-A004-en.pdf> [Accessed 10 September 2025].

International Monetary Fund (2022a). Ghana: 2022 Article IV Consultation – Staff Report. *IMF Country Report No. 23/38*. International Monetary Fund. [online] Available at: <https://www.elibrary.imf.org/view/journals/002/2023/038/article-A002-en.xml> [Accessed 5 September 2025].

International Monetary Fund (2024). Global Financial Statistics. *IMF*. [online] Available at: <https://www.imf.org> [Accessed 7 September 2025].

International Monetary Fund. African Dept. (2024). Ghana. *IMF Staff Country Reports*, 2024(030), 1. <doi:10.5089/9798400266768.002>

Johansen, S. (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, 59(6), 1551-1580. <doi:10.2307/2938278>

Johansen, S. (1995). Likelihood-based inference in cointegrated vector autoregressive models. Oxford University Press. <doi:10.1093/0198774508.001.0001>

Kabiru, Y., Musa, Y., Isah, B.Y., and Ilyasu, M.I. (2025). 'Oil price fluctuations and macroeconomic indicators: an ARDL and NARDL approach'. *Revista O Universo Observável*, 2(1), 2–17. <doi:10.69720/2966-0599.2025.00026>

Karimu, S. (2024). Ghana and the IMF: Policy shifts, economic bailouts and macroeconomic outcomes. *Journal of Policy Modeling*, 46(6), 1146–1164. <doi:10.1016/j.jpolmod. 2024.07.006>

Kindo, M.D., Adams, A.A., and Mohammed, J. (2024). The impact of trade on environmental quality and sustainable development in Ghana. *World Development Sustainability*, 4, 100134. <doi:10.1016/j.wds.2024.100134>

Krugman, P.R., and Obstfeld, M. (2020). International Economics: Theory and Policy. 11th ed. Pearson Education.

Kutu, A.A., and Ohonba, A. (2024). Africa's Growth Performance Amidst Inflationary Pressure and Current Account Deficit: Will Diversification Spur a Better Trajectory? *International Journal of Religion*, 5(12), 1317–1331. <doi:10.61707/sk6knk26>

Leshoro, T.L.A. (2024). Inflation Dynamics and Policy Mix in Ghana. *Folia Oeconomica Stetinensia*, 24(1), 124–143. <doi:10.2478/foli-2024-0008>

Lopes, C. (2024). "Lost Decades or Blessing?" In: Lopes, C. *The Self-Deception Trap*. Springer Nature Switzerland, 83–103. <doi:10.1007/978-3-031-57591-4_5>

Mahama, I., Banoeyele, P., and Solomon Asamoah (2024). Implication of Oil Price Fluctuations on GDP Growth in Ghana. *Malaysian Journal of Business, Economics and Management*, 221–233. <doi:10.56532/mjbem.v3i2.64>

Mbwambo, S.K., Mchukwa, E.W., and Mchomvu, Z.B. (2024). Analysis of the Impact of Crude Oil Price Changes on Economic Growth in Tanzania: ARDL Econometric Model. *SCIENCE MUNDI*, 4(2), 11–20. <doi:10.51867/scimundi.4.2.2>

Ministry of Finance, Ghana (2025). Fiscal data handbook 2014–2024. Accra: Ministry of Finance. [online] Available at: <https://www.mofep.gov.gh/publications/fiscal-data> [Accessed 5 October 2025].

Mishkin, F.S. (2018). *The Economics of Money, Banking, and Financial* Markets. 12th ed. Pearson.

Mo, B., Zeng, H., Meng, J. and Ding, S. (2024). The connectedness between uncertainty and exchange rates of oil import countries: New evidence from time and frequency perspective. *Resources Policy*, 88, 104398. <doi:10.1016/j.resourpol.2023.104398>

Mohamed, E.A.H. and Saleh, A.O.H. (2024). The Impact of Exchange Rate Change on Inflation Using Bibliometric Analysis from 1975 to 2024. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 14(4), 940–957. <doi:10.6007/IJARAFMS/v14-i4/23712>

Mussa, M. (1984). "The theory of exchange rate determination". In: Bilson, J.F.O. & Marston, R.C. (eds.). *Exchange rate theory and practice*. University of Chicago Press, 13–78.

Musikavanhu, L.T. and Gamariel, G. (2024). Do institutions matter for oil prices and economic growth relationship? A regulatory policy implication. *Journal of Governance and Regulation*, 13(4), 132–143. <doi:10.22495/jgrv13i4art13>

Nandi, B.K., Kabir, M.H., and Nandi, M.K. (2024). Crude oil price hikes and exchange rate volatility: A lesson from the Bangladesh economy. *Resources Policy*, 91, 104858. <doi:10.1016/j.resourpol.2024.104858>

National Petroleum Authority (2023a). Petroleum downstream statistical bulletin. [online] Available at: <https://npa.gov.gh/downstream-bulletin/> [Accessed 23 August 2025].

National Petroleum Authority (2023b). Downstream Petroleum Industry Report for Third Quarter 2023. Accra: National Petroleum Authority. [online] Available at: <https://npa.gov.gh/wp-content/uploads/2023/12/Petroleum-Downstream-Industry-Report-for-Q3-2023.pdf> [Accessed 6 August 2025].

Nchofoung, T.N. (2024). Oil price shocks and energy transition in Africa. *Energy Policy*, 184, 113855. <doi:10.1016/j.enpol.2023.113855>

Okeke, S.O., Nwoha, C.E., and Duru, A.N. (2024).'Effect of Crude Oil Price Shock on Inflation and Exchange Rate in Nigeria. *European Journal of Business and Innovation Research*, 12(2), 56–66. <doi:10.37745/ejbir.2013/vol12n25666>

Omane-Adjekum, C., Bosomtwe, E., and Adegbedzi, D.K. (2024). Monetary Policy, Institutional Quality and Economic Growth: The Ghanaian Narrative. *OALib*, 11(07), 1–24. <doi:10.4236/oalib.1111798>

Omotosho, B., and Tumala, M. (2024). Monetary Policy in an Oil-Exporting Emerging Economy with Fuel Subsidies. *Central Bank of Nigeria Journal of Applied Statistics*, 1, 113–151. <doi:10.33429/Cjas.01024.4/7>

Opayinka, T.K. (2025). The Interplay between Fiscal Policy, Inflation and Economic Growth in Nigeria: An ARDL Approach. *International Journal of Research and Innovation in Social Science*, VIII(XII), 259–274. <doi:10.47772/IJRISS.2024.815EC0021>

Oteng, C., Iledare, O., and Sebu, J. (2024). Vulnerability of the Agricultural Commodity Markets in Ghana to Global Oil Price Fluctuations: An Empirical Analysis. *Sage Open*, 14(1), 21582440231219121. <doi:10.1177/21582440231219121>

Owusu, F., and Sarpong, E. (2021). Examining the Effect of Fluctuating Petroleum Prices on the Ghanaian Economy. *Journal of African Development*, 33, 412–430.

Oyelami, L.O., Adekunle, B.S., and Oluwakemi, A.M. (2025). Investigating the Pass-Through Effect of Global Oil Price Shock on Domestic Inflation in Selected African Countries. *Croatian Economic Survey*, 26(2), 41–61. <doi:10.15179/ces.26.2.2>

Ozigbu, J.C. (2024). Oil Price Shock and Trade Balance in Nigeria. *IIARD International Journal of Economics and Business Management*, 9(5), 13–25. <doi:10.56201/ijebm.v9.no5.2023.pg13.25>

Peprah, W.K., Anowuo, I., Owusu-Yeboah, E., Ameyaw, D.A.K., and Sabas, L. (2024). COVID-19 Pandemic and Ghana's Economy: A Deep Dive into Economic Indicators. *International Journal of Economics and Financial Issues*, 14(6), 145–152. <doi:10.32479/ijefi.17167>

Rasaki, M., and Chukwu, A. (2024).'Commodity price shocks and monetary policies in commodity exporting African countries—A DSGE analysis. *Central Bank of Nigeria Journal of Applied Statistics*, 1, 217–246. <doi:10.33429/Cjas.01024.7/7>

Rith, D. (2024). Hedging Oil Shocks in Monetary Policy. *Journal of Management Policy and Practice*, 25(4). <doi:10.33423/jmpp.v25i4.7460>

Rodrik, D. (2018). *Straight Talk on Trade: Proposals on how to make this World Economy a Sane One*. Princeton University Press.

Saani, M.R., Abdulai, A.M. and Salifu, M. (2024). Inflation, public debt and unemployment nexus in Ghana. An ARDL analysis. *Cogent Economics & Finance*, 12(1), 2345296. <doi:10.1080/23322039.2024.2345296>

Sanusi, K.A., and Kapingura, F.M. (2024). Asymmetric effects of exchange rate and oil price on export performance and economic growth in WAMZ. *International Journal of Applied Economics, Finance and Accounting*, 21(1), 1–16. <doi:10.33094/ijaefa.v21i1.2033>

Schwarz, G. (1978). Estimating the dimension of a model. *Annals of Statistics*, 6(2), 461–464. <doi:10.1214/aos/1176344136>

Seidu, A.M., and Vasilev, A. (2024). Budget Deficit, Debt, and Inflation in Ghana (1960-2022): The Fiscal Theory of Inflation Case? *Theoretical and Practical Research in Economic Fields*, 15(1), 101. <doi:10.14505/tpref.v15.1(29).10>

Sims, C.A. (1980). Macroeconomics and Reality. *Econometrica*, 48(1), 1-48. <doi:10.2307/1912017>

Taylor, A.M., and Taylor, M.P. (2004). The Purchasing Power Parity Debate. *Journal of Economic Perspectives*, 18(4), 135–158. doi:10.1257/0895330042632744>

Umoru, D., Obomeghie, M.A., and Igbinovia, B. (2024). Devaluation, goods price variation and trade flows. *The Central European Review of Economics and Management*, 8(3), 41–88. <doi:10.29015/cerem.990>

Wanzala, R.W., and Obokoh, L.O. (2024). Sustainability Implications of Commodity Price Shocks and Commodity Dependence in Selected Sub-Saharan Countries'. *Sustainability*, 16(20), 8928. <doi: 10.3390/su16208928>

World Bank (2017). Crisis Response and Resilience to Systemic Shocks: Lessons from IEG Evaluations. *Independent Evaluation Group, World Bank Group*. [online] Available at: <https://ieg.worldbankgroup.org/sites/default/files/Data/reports/building-resilience.pdf> [Accessed 19 September 2025].

World Bank (2019). Ghana Economic Update: Enhancing Financial Inclusion. *World Bank*. [online] Available at: <https://documents1.worldbank.org/curated/en/395721560318628665/pdf/Fourth-Ghana-Economic-Update-Enhancing-Financial-Inclusion-Africa-Region.pdf> [Accessed 15 August 2025].

World Bank (2021). Nigeria Development Update: Resilience through Reforms. *World Bank Group*. [online] Available at: <https://www.worldbank.org/en/country/nigeria/publication/nigeria-economic-update-resilience-through-reforms> [Accessed 17 September 2025].

World Bank (2022a). Ghana Economic Update – Preserving the Future: Rising to the Youth Employment Challenge (English). *Ghana Economic Update; 6th edition*. Washington, D.C.: World Bank Group. [online] Available at: <http://documents.worldbank.org/curated/en/099625006292235762> [Accessed 12 August 2025].

World Bank (2022b). Global Economic Prospects (June 2022). *World Bank*. [online] Available at: <https://thedocs.worldbank.org/en/doc/18ad707266f7740bced755498ae0307a-0350012022/original/Global-Economic-Prospects-June-2022.pdf> [Accessed 15 September 2025].

World Bank (2023). World Development Indicators. *World Bank*. [online] Available at: <https://databank.worldbank.org/reports.aspx?source=2&series=SP.POP.TOTL> [Accessed 30 August 2025].

World Bank (2025). World Development Indicators and Commodity Price Data (Pink Sheet). Washington, DC: The World Bank. [online] Available at: <https://www.worldbank.org/en/research/commodity-markets> [Accessed 15 September 2025].

Yeboah, E., and Baffour, A.A. (2024). The Relationship Between Inflation and Trade Openness: Evidence from Ghana'. *Köz-Gazdaság*, 19(4), 69–89. <doi:10.14267/RETP2024.04.05>

Yeboah, S.D., Fumey, M.P., Winful, S.A., Otoo, I.C., and Owusu Junior, P. (2025). Asymmetric dependence between commodity prices and selected macroeconomic variables in Ghana. *Scientific African*, 28, e02739. <doi:10.1016/j.sciaf.2025.e02739>

Young, C., Adu, D., Kofi Baah, B., and Emmanuel, B.G. (2024). The State of Energy in Ghana and The Need for International Cooperation for Its Potential Resource Development. *E3S Web of Conferences*, 545, 01005. <doi:10.1051/e3sconf/202454501005>

Zubairu, I., Alenezi, M., Iddrisu, A.J., and Dawson, S. (2024). The Dynamics of the Ghanaian Currency Depreciation: A Case Analysis of the Performance of Ghana Cedi (GHC) Against Its Major Trading Currencies. *International Journal of Economics, Finance and Management Sciences*. <doi:10.11648/ijefm.20241201.13>